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HUMAN ASPECTS OF HIGHWAY ACCIDENTS IN NEWFOUNDLAND

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ABSTRACT

An investigation of the human aspects of highway traffic accidents in Newfoundland, Canada, reveals alcohol impairment, driver inattention, and child pedestrian safety to be the areas of major concern. The study shows a number of human aspects contributing to motor vehicle accidents to behave in Newfoundland as in other jurisdictions, however, some aspects such as fatigue behave quite differently.

The methodology permits the focus of financial and human resources on the highway safety problems evident in a sub region of a national fabric and allows the saving of resources which otherwise would be allocated to national problems not found in the sub region.

HIGHWAY TRAFFIC ACCIDENTS with their associated property damage, personal injuries and fatalities remain a major concern in the province of Newfoundland, Canada, despite implementation of mandatory seat belt use legislation in 1982. Scarce financial and human resources dictated a methodology be established to permit a focus on the most significant contributing factors to motor vehicle accidents.

This paper documents a brief overview of the highway safety literature with relevance to Newfoundland, establishes a methodology for determining the significance of the various contributing factors to motor vehicle accidents, and identifies the focal areas for accident countermeasures in Newfoundland.

HIGHWAY SAFETY LITERATURE

The scope of the search for significant contributing factors to motor vehicle accidents was narrowed by an ongoing literature review. Forbes (1:3)* indicated errors, lapses, and limitations of automobile drivers to be responsible in 75% to 90% of motor vehicle accidents. The American Association of Automotive Medicine (2:338) showed environmental factors to either cause or directly increase the severity of 60% of the accidents. Vehicle malfunctions were explained by the Canada Safety Council (3:2) to be responsible for only 10% of the accidents. The Province of New Brunswick, Canada, (4:8) indicated approximately 5% of all reportable traffic accidents were caused by poor road conditions.

A fuller understanding of the limitations of automobile drivers was obtained by reviewing the temporal dimensions of motor vehicle accidents as well as driver characteristics.

Darkness played a role in 35-50% of highway accidents. In 1975, 54.6% of Canadian fatal accidents occurred at night (5:30). Older drivers however appeared to have more accidents during daylight hours as they tended to avoid night driving (6:175).

In the U.S.A. and Europe, a much higher accident rate was observed (7:37) in winter between 1600 and 2000 hours than in the summer most probably due to the earlier darkness during winter months.

Sex and age characteristics of drivers involved in motor vehicle accidents revealed interesting data. Forbes (1:80) indicated males had more accidents and convictions than females in the U.S.A. but when miles driven were taken into account, the differences essentially disappeared.

In New Brunswick, 1983, 76% of drivers involved in accidents were male and 24% were female (4:20).

Absolute indices of performance showed older drivers in the U.S.A. and Canada as

*Numbers in parentheses designate references at end of paper. The page in the reference is noted second in the sequence.

having fewer accidents than did drivers of other ages. However, when the distance driven was incorporated into the computation of accident rates, the distribution assumed more of a "U" shape, with the younger and older drivers showing worse experience than did drivers 20-40 years old. Planek (6:175) concluded, though, that elderly drivers were more likely to be killed in traffic accidents.

The epidemiology of motor vehicle accidents indicated a number of causal factors including fatigue, alcohol impairment, impairment by illegal drugs, impairment by prescription drugs, driver inattention and distraction, physical disability, illness while driving, and loss of consciousness. While alcohol and illegal drugs were the subject of a large number of studies, the other factors were relatively briefly treated in the available literature with most of the information being obtained from the Province of Saskatchewan, Canada.

Forbes (1:288) estimated 30-55% of highway fatalities in the U.S.A. were directly attributable to fatigue or drowsiness. As would be expected, there was a greater tendency to fall asleep at the wheel driving in darkness.

A survey by Nelson (8:186) of Canadian drivers who died in automobile accidents showed at least 50% had been drinking. Further Simpson and Warren (9:192) showed 20% of drivers on the road at night in North America had been drinking.

In British Columbia, 1981, Lifeline (10:8) reported both drinking and non-drinking drivers aged 16-19 were involved in 33% of fatal alcohol related traffic accidents, 28% of fatal crashes, and 32% of injury crashes. Sixty-five percent of alcohol related fatal crashes occurred between 2000 hours and 0800 hours. Sixty-five percent of alcohol related fatal crashes involved males.

The OECD (5:35) reported that in Germany, 1976, 3% of daytime accidents involved alcohol as a contributing factor, in twilight 6.4%, and in darkness 17.7% and that in the Netherlands, 21% of night time accidents involving alcohol occurred between 2200 and 2400 hours, 33% occurred between 0 and 0200 hours, and 28% between 0200 and 0400 hours.

The Insurance Institute for Highway Safety (11:2) recently released a study in California that showed of fatally injured male drivers aged 15-34 years, 37% were found with marijuana in their system, while 11% had cocaine.

Prescription drugs impaired 0.1% of drivers involved in accidents in 1983 in the Province of Saskatchewan (12:7).

Driver inattention or distraction accounted for 28.1% of the accidents in the same year in Saskatchewan (12:7).

Physical disability accounted for 0.3% of the accidents in the Province of New Brunswick (4:20) and 0.2% in Saskatchewan (12:7) during 1983.

Illness while driving and loss of consciousness each affected 0.1% of the drivers in Saskatchewan (12:7) during 1983.

Pedestrian involvement in motor vehicle accidents showed a difference between developed and undeveloped countries. In 1968 about 16% of the automobile accident fatalities in the U.S.A. were pedestrians. South Africa, however reported pedestrians to be involved in 40-55% of accidents.

Amongst pedestrians, age and sex showed interesting phenomenon. Children ran a particularly high risk as compared to other age groups. In several West European countries the figures showed between 25% and 65% of all pedestrian casualties were aged nine and under. Preschool children were also particularly vulnerable. On average, 11% of the casualties in 1977 were aged under six years. These studies (14:93) revealed many preschool children's accidents occurred because of inadequate parental supervision in traffic and the lack of instruction relating to road safety for their children.

British research (15:143) indicated the rate for pedestrians aged 60 years and over who were killed or injured in motor vehicle accidents in 1978 was over twice the rate for pedestrians aged 15 to 59 years. This pattern is seen not only in Britain, but in almost all developed countries. These high casualty rates were partly explained by the elderly spending more time as pedestrians and therefore being at greater risk.

With regard to sex, studies in Britain (16:135) show the accident rate for boys aged 1-15 was approximately double that for girls of the same group.

The highest accident rate for adults and older pedestrians occurred in November and December, whereas for children the accident rate was high in spring and summer due to their increased exposure during the summer holidays. For children, there was a higher absolute risk on weekdays rather than on weekends, which was connected with their journey to and from school. For elderly pedestrians, there was also a higher accident frequency during weekdays.

Associated with most of these documented roadway safety problems were numerous countermeasures. The exhaustive implementation of which would be beyond the financial and human resources of most agencies. The literature review did however focus attention on the driver and the various driver characteristics contributing to highway traffic accidents.

METHODOLOGY

The Province of Newfoundland, Canada, experienced 12,453 reportable motor vehicle accidents in 1983. These were composed of 10,203 accidents where the property damage exceeded $400. (Cd), 2147 personal injury, and 103 fatal.

Each accident was documented on a standard accident report form (17) administered by either the Royal Canadian Mounted Police or by

the Royal Newfoundland Constabulary. The reports were filed with the Department of Transportation and subsequently culled for data indicated by the literature review as being important.

Accidents were classified as being property damage, personal injury, and fatal. The temporal dimension was captured as month, day of week, and hour of day. Vehicle type and pedestrian involvement were identified. The age and sex of drivers and pedestrians were obtained. Finally the following list of causal factors was employed to classify each accident as reported by the investigating police officer:

Driver Inattention
Driver Distraction
Had Been Drinking
Driving While Impaired
Extreme Fatigue
Fell Asleep
Driver Inexperience/Confusion
Lost Consciousness
Physical Disability
Prescription Medication
Drugs (Illegal)
Illness
Pedestrian Error/Confusion

The statistical analysis system (SAS) was used to generate comparative statistics to those found in the survey of safety literature. A number of the factors were combined to assist in the comparison; driver inattention was broadened to include distraction and inexperience/confusion, had been drinking and driving while impaired were combined, as were extreme fatigue and fell asleep.

DISCUSSION OF FINDINGS

Unlike the findings of Forbes (1:3) human factors were found to be contributing elements in only 37% of Newfoundland accidents. The overall distribution was as shown on Table 1:

Table 1

Driver Inattention	30.73
Alcohol	4.48
Fatigue	0.85
Pedestrian Error/Confusion	0.76
Lost Consciousness	0.13
Prescription Medication	0.10
Physical Disability	0.06
Illness	0.03
Illegal Drugs	0.02
Total	37.16

The breakdown by accident type however reveals human factors contributed to 36% of property damage, 42% of personal injury, and 63% of fatal. As well, the relative ranking of the importance of the contributing factors changed as shown on Table 2:

Table 2

	Property Damage	Personal Injury	Fatal
Driver Inattention/ Distraction	31.22	28.64	26.21
Alcohol	3.68	7.17	27.18
Fatigue	.61	2.05	-
Pedestrian Error/ Confusion	.06	3.82	6.80
Lost Consciousness	.08	.33	.97
Prescription Medication	.08	.19	-
Physical Disability	.04	.09	.97
Illness	.02	.09	-
Illegal Drugs	.01	-	.97

A number of issues relative to successful employment of countermeasures were raised by this portion of the analysis. Research was identified as being required into the care and accuracy of police reporting based on the large difference in causality evidenced for human factors between property damage and fatal accidents.

Research was also identifed as being required into the nonhuman factors of environment, vehicle, and roadway due to the relatively low percentage of accidents explained by human aspects. The environment of Newfoundland was noted for fog and ice conditions, however vehicles required annual safety inspection and roads were designed to guidelines suggested by the Roads and Transportation Association of Canada. For these reasons and based on the evidence of Forbes (1:3) these factors had not been included in the study.

Most important however was the decision whether to focus countermeasures so as to reduce all accidents or to focus on the more severe. In light of the above limitations to the present research into human aspects, emphasis should be placed on developing countermeasures to reduce fatal highway accidents in Newfoundland.

Comparison with the temporal dimensions of accidents indicated darkness to play a role in 26% of Newfoundland accidents. This indicated a lower night accident rate than national data. For fatal accidents, however, the data suggested darkness to contribute to 46% of the motor vehicle accidents, only slightly less than the national data and not statistically different.

Identical to New Brunswick 76% of the drivers involved in motor vehicle accidents were male. Data relevant to the distribution of human contributing factors by sex as reported on Table 3 were subjected to a chi-square test for significance of difference.

Table 3

	Male	Female
Driver Inattention	2827	1000
Alcohol	531	27
Fatigue	91	15
Pedestrian Error/Confusion	60	35
Lost Consciousness	12	4
Prescription Medication	8	4
Physical Disability	7	-
Illness	1	3
Illegal Drugs	2	-

The chi-square statistic confirmed at the 99% confidence level the following differences:

Newfoundland males are more likely to have accidents under the influence of alcohol and fatigue

Newfoundland females are more likely to have accidents under the influence of prescription medication and illness.

Male drivers represented 87% of the casualties in fatal accidents. Table 4 reports the distribution by sex of causal factors for the fatal accidents.

Table 4

	Male	Female
Driver Inattention	22	4
Alcohol	27	1
Fatigue	1	-
Pedestrian Error/Confusion	5	-
Lost Consciousness	2	-
Prescription Medication	1	-
Physical Disability	1	-
Illness	-	-
Illegal Drugs	1	-

The paucity of data precluded a test of significance, however, general indications pointed towards a significantly higher number of alcohol impaired male drivers.

Detailed analysis of specific human aspect causal factors for motor vehicle accidents indicated some sharp differences and some clear comparisons with the body of safety literature reviewed.

Fatigue did not play a significant role in the accident situation unlike the expectations reported by Forbes (1:288).

Alcohol at 27% represented the greatest causal factor in fatal accidents. This problem is substantially less than the 50% reported by Nelson (8:186). Males aged 20-34 was the group most strongly identified with alcohol related accidents. In fact male drivers overall were involved in 95% of the alcohol related accidents.

Illegal drugs was stated as a contributing factor in only 2 accidents in Newfoundland during 1983. One of these accidents was property damage while the other was a fatality. In both cases, the impaired person was male and between 20-24 years old.

The lack of significance of this factor may be related to the lack of search for illegal substances during autopsy unless prior indications so indicate.

Prescription drugs, as in Saskatchewan, were equally insignificant, or at least were not measured, in drivers of motor vehicles involved in accidents.

Driver inattention, similar to Saskatchewan, accounted for 30.7% of all accidents and 26.2% of fatal accidents. No real difference was found between male and female, however, males aged 25-34 were involved in the majority of the accidents caused by inattention.

Physical disability and illness while driving were equally as insignificant as the data reported by New Brunswick and Saskatchewan.

Similar to the experience in the U.S.A. pedestrians represented only 10% of the highway fatalities.

Children aged nine and under accounted for 34% of all pedestrian casualties while preschoolers aged six years and under were involved in 18% of all pedestrian injuries and fatalities.

Unlike British research (15:143) indicating the accident rate for pedestrians aged 60 and over was twice that for pedestrians aged 15 to 59 years, the Newfoundland research indicated only 4% of pedestrian casualties were elderly while 30% of pedestrian casualties were in the age group from 15 to 59.

Male pedestrians aged 10-14 were at the greatest risk while male pedestrians aged 65 and over were the least susceptible to traffic accidents.

Of females, the age group 0-4 years was at greater risk.

The small sample size of 155 pedestrian accidents made meaningless any detailed analysis with respect to the temporal dimension.

FURTHER ACTION

The review of the human aspects of highway accidents in Newfoundland discovered a number of areas requiring further action.

The need for careful and complete accident report documentation must be impressed upon the Royal Canadian Mounted Police and the Royal Newfoundland Constabulary.

Research into the contributing factors of environment, vehicle, and road condition is necessary in Newfoundland despite a body of safety literature which places major weight upon the driver.

Countermeasures specific to alcohol impairment, driver inattention, and child pedestrian safety are urgently required in Newfoundland. By placing the focus of human and financial resources on these aspects the level of highway safety in Newfoundland would be significantly improved. Further research into the transfer of countermeasures developed in other jurisdictions to application in Newfoundland is also required.

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